

## On the occurrence of buckler crab *Cryptopodia angulata* in the coastal waters of India

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The trend of marine non-indigenous species in India has been increasing, with more than half of the species probably being introduced by shipping. A live specimen of buckler crab *Cryptopodia angulata* was found along the west coast of India at 40 m depth. The recent new records at different Indian coastal locations suggest that the crab is widening its distribution. Shipping is thought to be the possible introduction vector (via ballast) for the spread of *C. angulata* in the coastal waters of India. Further, the favorable environmental conditions prevalent in the Indian coastal waters may facilitate the establishment and subsequent spread of *C. angulata*. The invasion of this buckler crab may have negative impact on the native species. Although not present in detectable numbers, *C. angulata* may pose a major threat to the native species, if it establishes. Information on the establishment and distribution of *C. angulata* from other locations along the Indian coast would be essential to comprehensively and effectively address the threat.

[**Keywords:** Non-indigenous species; Arabian coast; Ballast waters; Maritime activities]

### Introduction

The spread of marine non-indigenous species is considered as one of the most significant global modifiers of marine biodiversity<sup>1,2,3,4</sup>. Indian Ocean is one of the areas most severely affected by biological invasions, in terms of the number of detected non-indigenous species and the rate of their introduction<sup>5</sup>. In particular, brachyuran crabs are often a major component of bio-invasions and commonly alter the native community structure<sup>6,7</sup>. The non-indigenous crabs may threaten the native fauna by altering the habitats and thereby causing a reduction in the population of native species, and in some cases the impacts go unnoticed<sup>8,9</sup>. In this paper, we document the spread of *Cryptopodia angulata* in the Indian coastal waters.

### Materials and Methods

A small male specimen of *C. angulata* was accidentally caught in a Van Veen grab sampler at a depth of 40 m along the south-west coast of India (12°86'N; 74°63'E). The crab was measured (mm) using a Vernier caliper, preserved in 10% formalin and identified using taxonomic keys<sup>10</sup>. The identified crab was deposited in the collections of NCCR.

### Results and Discussion

The crab *C. angulata* was previously reported to be

well established in Australia, Indonesia, Singapore, Malaysia, Thailand, Bangladesh, Sri Lanka, Maldives and Pakistan<sup>10,11,12,13,14</sup> (Fig. 1).

In India, this crab was first reported from the Orissa and Malabar coasts<sup>15</sup>; however, later Chiong and Ng<sup>10</sup> suggested that the species reported by Alcock<sup>15</sup> was most likely *C. echinosa* based on the original description and also no figure was provided. Fatemi<sup>16</sup> described that *C. echinosa* superficially resembled *C. angulata*. Therefore, it may suggest that it was a misidentification of *C. angulata* by Alcock<sup>15</sup>. Recently, the *C. angulata* species was reported at Point Calimere<sup>17</sup> and was subsequently observed in the coastal waters of Gujarat and Chennai<sup>18,19</sup> as represented in Table 1. In the present investigation, the crab *C. angulata* was observed off Mangalore, south-west coast of India (Figs. 2(a) and 2(b)). The observation of few individuals of this crab as well as the timing of the consecutive findings from several Indian coastal locations suggest that the species has recently dispersed in the Indian waters and likely to further widen its range and establishment (Table 1). The occurrence of *C. angulata*, including mature males and females, at different sites provides evidence that this species has of late emerged in the Indian waters and is already well established. These crabs mostly prefer the depths of 25 to 30 m<sup>18</sup>. However, in our observation, the specimen of

*C. angulata* was found at a depth of 40 m, which is

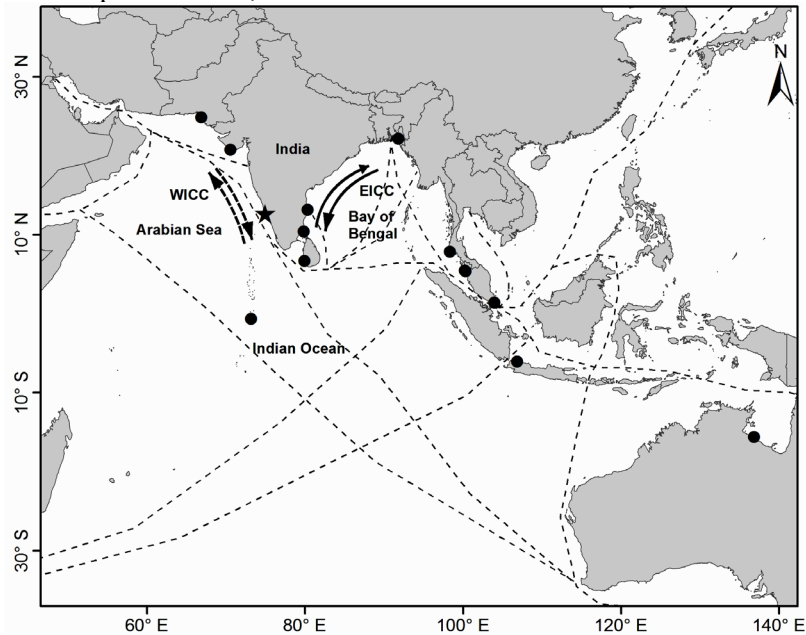


Fig. 1 — Distribution map of *Cryptopodia angulata*. Black star indicates present record; black circles indicate records from earlier reports. Dotted lines represent major shipping routes, dotted black arrows the West Indian Coastal Current (WICC), and solid black arrows the East Indian Coastal Current (EICC).

Table 1 — The distributional records of *Cryptopodia angulata* in coastal waters of India based on present and published reports

Lat.	Long.	Year	Depth (m)	Sex	No. of specimens	Carapace (mm)	Reference
12°86'N	74°63'E	2014	40	M	1	CL 37.18, CW 22.90	Present study
13°13'N	80°30'E	2013	-	F	1	CL 0.63, CW 0.34	Silambarasan <i>et al.</i> , 2015
20°83'N	70°49'E	2012	25-27	F	1	CL 52.76, CW 32.30	Trividi & Vachhrajani, 2013
10°18'N	79°51'E	2009	25	M/F	5 (M-4; F-1)	CL 23.2 - 45.1, CW 15.1-29.2 (M); CL 46.4, CW 30.7 (F)	Ravichandran <i>et al.</i> , 2010

CL: Carapace length; CW: Carapace width; M: Male; F: Female

slightly higher than its native range (30 m). The texture of the sediment where this crab was found was silty sand [silt (85.1%), sand (11.9%) and clay (3%)] suggesting that this species prefers silty areas. The physical and biogeochemical characteristics of Arabian Sea and Bay of Bengal are different, which facilitates the survival and growth of diverse non-indigenous species<sup>20</sup>. The sighting of *C. angulata* at different sites and depths in the present and previous studies suggests that the environmental conditions in the coastal waters of India favor the establishment of this non-indigenous crab. The database of marine non-indigenous species in India provides limited evidence of the modes of entry. Therefore, it is difficult to arrive at definitive conclusions on the initial entry of *C. angulata* in the Indian coastal waters. A significant number of Indo-Pacific aquatic species reach the Indian coasts via maritime

activities<sup>21</sup>. The Indian coast receives heavy passenger and commercial ship traffic originating from several ports. The disposal of ballast water from these ships can introduce non-indigenous species to the Indian coastal waters<sup>22</sup>. Therefore, shipping is assumed to be the important introduction vector (via ballast) of this species into the Indian coastal waters. Ballast water is well known internationally and intra-regionally as an effectual vector for the introduction of marine organisms<sup>23</sup>. Consequently, we suspect that the larvae or juveniles of *C. angulata* entered the Indian waters via the ballast water from ships, as previously reported for other species of decapods<sup>24,25,26</sup>. In addition, the circulation patterns of currents (*viz.*, East Indian Coastal Current in Bay of Bengal and West Indian Coastal Current from the Arabian Sea) may also contribute to its accelerated dispersal along the coastal waters of Indian Ocean.

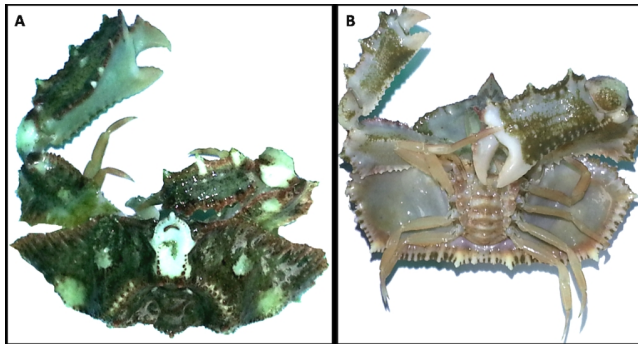


Fig. 2 — The male specimen of *Cryptopodia angulata* (A: Dorsal view, B: Ventral view)

From the observed results, it may be concluded that the non-indigenous buckler crab, *C. angulata* has expanded its geographical range in the eastern and western coastal waters of India. Since, the present and previous records have been of small numbers; it may not be an immediate threat to native fauna. However, the epidemic outburst of such population may have consequences for the native biodiversity. Therefore, periodic surveys are necessary to monitor the distribution and population growth of non-indigenous species of *C. angulata* in the coastal waters of India.

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